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# Prevalence of Childhood Obesity in Elementary Schools in Lincoln, Nebraska: A study of Children on Free or Reduced Lunches

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UNDERGRADUATE THESIS PAPER

# Prevalence of Childhood Obesity in Elementary Schools in Lincoln, Nebraska: A study of Children on Free or Reduced Lunches.

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## Introduction

There is a major health problem affecting our nation's youth. Childhood obesity has become one of our nation's leading epidemics. According to the Center for Disease Control (CDC) childhood obesity has almost tripled over the past 30 years. Overweight is defined as having excess body weight in relation to a certain height from fat, muscle, bone, water, or a combination of them ("Adolescent and school," 2011). Obesity is defined as having an excess of body fat ("Adolescent and school," 2011). Overweight and obesity is a direct result of what is called a "calorie imbalance"; which is simply consuming too many calories and not expending enough through physical activity ("Adolescent and school," 2011). In my opinion, nutrition and healthy eating habits begin at home and the education needs to come from the parents. However, throughout most of the year, children spend the majority of their time in a school setting. Due to this time in school; our educational system has to become part of the solution instead of the problem. When budgets are cut at school, it seems that physical education classes and programs are the first to go. There are a lot of aspects of children's lives that can affect their physical activity and the opportunity to participate in physical activity. I believe that not only does physical activity in school affect the childhood obesity problem, but also, family socioeconomic status and green space in their surrounding community. There are other factors that can cause unhealthy children; these include: smoking and alcohol use (Pyle, Sharkey, Yetter, Felix, Furlong, Poston, 2006). Neither of these will be the focus of my project due to the fact that the age of children I am focusing on are younger, and smoking and alcohol are more teenage problems. I am focusing on elementary aged children.

I believe there is a direct relationship between childhood obesity and socioeconomic status. I also believe there is a direct relationship of children on free and reduced lunches and

percentage of obesity in these schools. According to the Kids Count Data Center from The Annie E. Casey Foundation, the percentage of children in Lancaster County on free and reduced lunches reached 31% in 2009. This was the last year of available data from the Foundations website. The guidelines set forth by the Food and Nutrition Services of the U.S. Department of Agriculture (ASDA) are followed by various offices to determine if a student is eligible for free or reduced lunch. My ultimate goal is to find out if children on free and reduced lunches that come from families of lower socioeconomic show a higher prevalence of obesity. Also, I want to collect data on the distance to green space in the surrounding communities of the schools in question. My hypothesis for this project is that children who are placed on free or reduced lunches in school are at higher risk for being overweight and obese. I think that there is a lot that can be learned from the results of this project. If we can show that there is relationship that is a major cause of childhood obesity, we can begin to take steps to alleviating the problem.

There are numerous consequences that are related to childhood obesity. These conditions become even more detrimental when encountered early in life. The CDC reports both immediate and long-term health effects. Immediate health effects can include: risk factors for cardiovascular disease, risks of developing diabetes, bone and joint problems, sleep apnea, social and psychological problems. Some long-term effects include: prevalence of adulthood obesity, heart disease, type 2 diabetes, stroke, many forms of cancers, and osteoarthritis ("Adolescent and school," 2011). Obesity puts individuals at higher risks of developing certain types of cancers; such as: “Breast, colon, endometrium, esophagus, kidney, pancreas, gallbladder, thyroid, ovary, cervix, and prostate, as well as multiple myeloma and Hodgkin’s lymphoma” ("Adolescent and school," 2011). Getting children to engage in even moderate physical activity would go a long ways to reducing their risks of certain conditions now and later in life. Some affects that even

moderate exercise could have on children could be lowered mortality rates, reduced risk of cardiovascular disease, diabetes mellitus, osteoarthritis, osteoporosis, improved mental health and an increased overall quality of life (Pyle, et al, 2006).

Aside from the multitude of health complications of obesity in children, children who are overweight or obese can also suffer from social and psychological problems. Some social and psychological problems include: depression, eating disorders, low self-esteem, and distorted body image (Pyle et al, 2006). Some former research has shown that self-concept is lower in children from lower socioeconomic classes than those from upper socioeconomic classes (Glovinsky-Fahsholtz, 1992). There are a few drawbacks to quantifying self-concept in children. Some researchers have stated that there are differences in self-concept depending on the age level of the children; other researchers have concluded that there is no difference between age groups (Glovinsky-Fahsholtz, 1992). The other problem is that a number of kids suffer from low self-esteem throughout childhood for reasons other than body weight (Glovinsky-Fahsholtz, 1992). Other adverse effects of obesity can be seen in our nation's wallets. It is estimated that obesity directly and indirectly costs our country around $139 billion in 2003 (Li & Hooker, 2009).

The process of the project will take place within the city of Lincoln, Nebraska. I will be looking at elementary schools based on the data such as: students on free and reduced lunches, and physical fitness results. Also, I will be comparing this data to the percentages of children who are considered to be overweight or obese in each school.

Some former studies have been done in the past looking at the relationship between childhood obesity and the impact that schools have on them. One study that I found was done my some researchers at Ohio State University, Dave Downey and Dr. Paul von Hippel. Their aim

was to find out if school had a positive or negative impact on childhood obesity. Their findings actually found that children part of the study had shown higher weight gain during the summer months when they were not in school; and showed less weight gain during the school year (von Hippel, Downey, Powell & Rowland, 2007).Their study was supported by the American Education Research Association, the Spencer Foundation, and the National Science Foundation. Von Hippel states that even though changes in vending machines and school lunches may help alleviate the problem slightly; the biggest impact will need to come outside of school. Even underweight children showed better improvement in BMI (Body Mass Index) during the school than they did during the summer months (von Hippel et al, 2007). Schools need to start playing a larger role in the education aspect of healthy eating behaviors and physical activity outside of the school setting (von Hippel et al, 2007). Most of the previous research done in this area has been in looking at school lunches and how they affect childhood obesity, or how the children's families' socioeconomic status affects their rates of obesity. Even though this is one aspect of my project, I will also be looking at the green space in the surrounding communities of these schools. An article I found from the U.S. News and World Report showed how one school in Minneapolis took a different approach to reducing their school's obesity problem. The principal, Bryan Bass, wanted to find a way to reduce the availability of soda pop in the vending machines and replace it with healthier choices, while still maintaining their contract with Coca-Cola. Bass swapped out 12 of the 16 machines with all water and offered them at 75 cents a bottle. He swapped three machines with juice and Gatorade and offered them at one dollar a bottle. He left one machine full of pop but raised the price to $1.25 per bottle. He then made it legal to for students to have water in class but not juice or pop. Remarkably, the profits had nearly tripled in two years (Spake, 2004). The main learning point from this study showed that kids will make

healthier choices when put in the right opportunity (Spake, 2004). I wanted to be able to show that if we can find a way to give children a chance to choose they may make better. However, it seems that many of these children are doomed from the start when their parents have to put them on free and reduced lunches because this is taking away a lot of choice for them and setting them up for failure. This is evident in the tables and figures I will provide later in the paper.

## Thesis Objective

The purpose of the project is to show that there is a direct relationship between childhood obesity and socioeconomic status. Other factors that go into this relationship include: physical activity and foods available in vending machines. My ultimate objective is to prove that children coming from low socioeconomic backgrounds are showing higher levels of obesity during childhood. I believe that this work, as well as other studies similar to this, can be used show that these children need more help and assistance. Many of these children are not taught proper eating habits; generally because cheaper foods are generally not nutrition and energy dense. Many families living in poorer neighborhoods do not have supermarkets close by, which greatly affects their eating behaviors (Flournoy, 2006). If we can get the word out that children will make better choices when given the opportunity, maybe we can encourage schools to provide healthier choices to their students.

## Materials and Methods

The process I was predominately using was data collection. Most of this information was available courtesy of Lincoln Public School health statistics. The information that I am seeking involves looking at percentages of children on free and reduced lunches, percentages of children passing the presidential fitness requirements, and the percentage of children in these schools

considered to be obese and overweight. Dr. Marybell Avery and Dr. Bob Rauner completed a study on Lincoln's Public Schools during the 2010-2011 school years; calling it the 2010-2011 Lincoln Public Schools Student Health Statistics (Avery & Rauner, 2011) (*see appendix A). I used much of the data they have found to integrate into my project. Also, I will be using some data collected on Lincoln Public Schools giving the percentages of students on free and reduced lunches from the Lincoln District Census Data File ("Statistical report on," 2010). Using the data from the Lincoln Public Schools system will work a lot like a case study as well. A great portion of the information I will be looking at has been done already and I will be using this data to support my hypothesis that children on free and reduced lunches are at higher risk of being overweight or obese in our communities elementary schools.

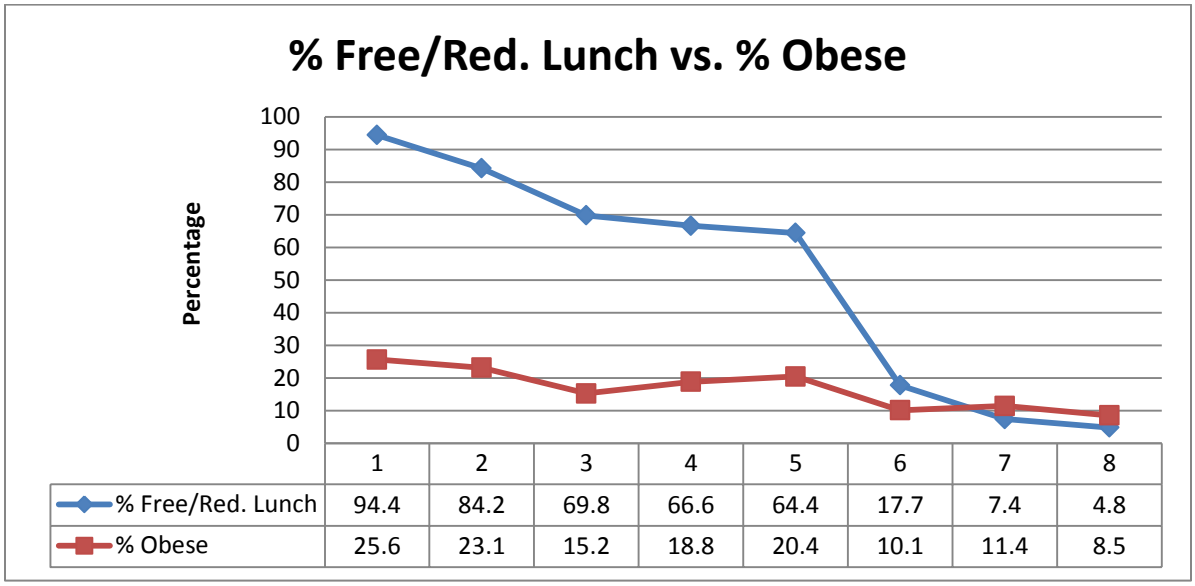
My first step included assessing the percentages of students in the Lincoln Public Schools in Elementary grade levels that are on free and reduced lunches. Next, I chose eight schools within the community at random to avoid any biases towards one or the other. I wanted to take a look at schools with low overweight and obesity rates as well as schools with high rates of overweight and obesity. I contacted administration within the Lincoln public school system to request permission to obtain data on the percentages of students passing the school aerobic fitness test, known as the Fitnessgram PACER. If I can get permission to obtain this data; students BMI is given on their results so this will allow me to find the number of students who are considered overweight or obese. Through GIS (Geospatial Information Systems) tracking, I will be finding the average salaries of families in the areas within each school district. Finally, I will visit each area and walk off distances to green space areas. This will allow me to find out how much access these children have to green space outside of school.

## Tables and Figures

In this next section, I will be presenting the findings from the data that was retrieved from Lincoln Public Schools. Data was provided by Lincoln public schools health statistics (Avery and Rauner, 2011). This data was formed by using eight randomly chosen elementary schools in Lincoln and compiled into graphs to show trends. I will present tables and the resulting figures and I will be discussing the findings in the discussion. Table 1 is looking at the connection between percentage of children on free or reduced lunches and percentage of children who are considered obese. The second table is looking at the connection between percentage of children on free or reduced lunches and percentage of children considered to be overweight. The third table is looking at the connection between percentage of children on free or reduced lunches and the percentage of children passing the physical fitness test.

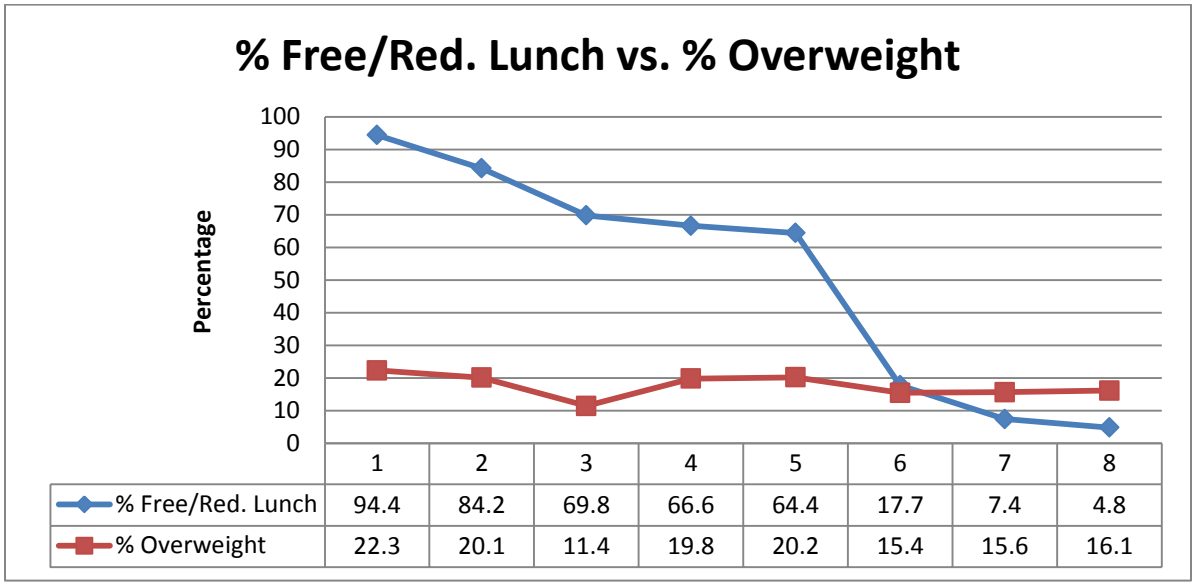
| **Table 1** | **% Free/Red. Lunch vs. % Obese** | |
|---|---|---|
| **School Name** | % Free/Red. Lunch | % Obese |
| Clinton | 94.4 | 25.6 |
| Hartley | 84.2 | 23.1 |
| Prescott | 69.8 | 15.2 |
| Lakeview | 66.6 | 18.8 |
| Arnold | 64.4 | 20.4 |
| Morley | 17.7 | 10.1 |
| Cavett | 7.4 | 11.4 |
| Maxey | 4.8 | 8.5 |

Figure 1.



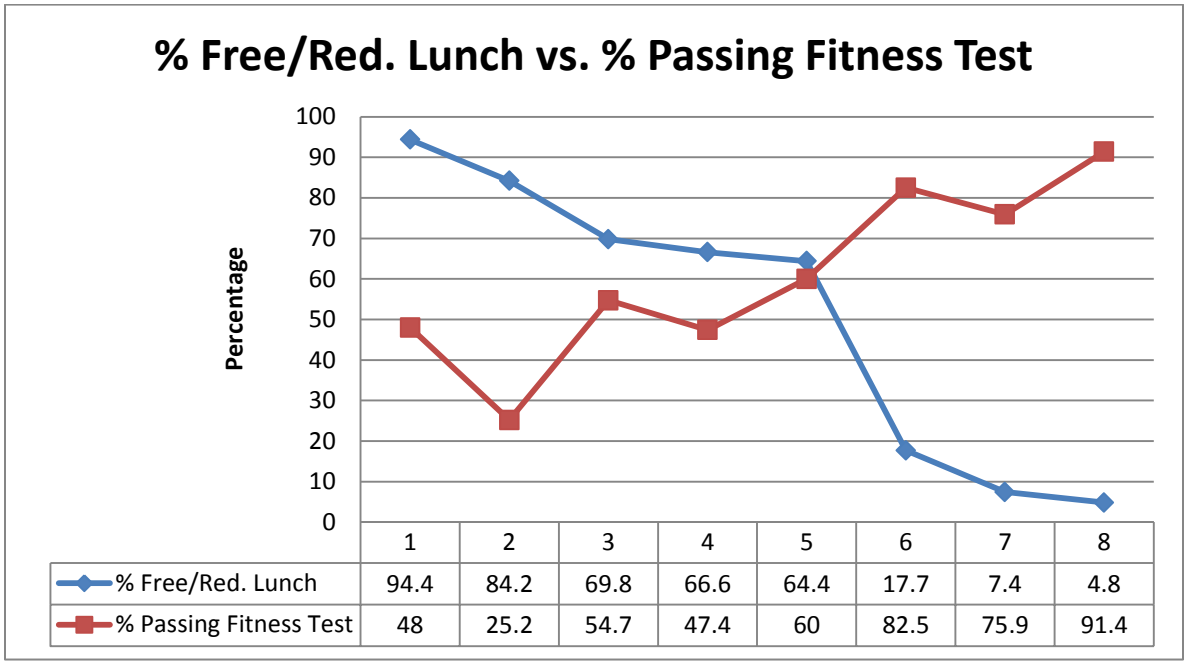

| **Table 2** | **% Free/Red. Lunch vs. % Overweight** | |
|---|---|---|
| **School Name** | % Free/Red. Lunch | % Overweight |
| Clinton | 94.4 | 22.3 |
| Hartley | 84.2 | 20.1 |
| Prescott | 69.8 | 11.4 |
| Lakeview | 66.6 | 19.8 |
| Arnold | 64.4 | 20.2 |
| Morley | 17.7 | 15.4 |
| Cavett | 7.4 | 15.6 |
| Maxey | 4.8 | 16.1 |

Figure 2.




| **Table 3** | **% Free/Red. Lunch vs. % passing fitness test** | |
|---|---|---|
| **School Name** | % Free/Red. Lunch | % Passing Fitness Test |
| Clinton | 94.4 | 48 |
| Hartley | 84.2 | 25.2 |
| Prescott | 69.8 | 54.7 |
| Lakeview | 66.6 | 47.4 |
| Arnold | 64.4 | 60 |
| Morley | 17.7 | 82.5 |
| Cavett | 7.4 | 75.9 |
| Maxey | 4.8 | 91.4 |

Figure 3.




## Results

Analysis of these graphs shows a couple different relationships between children on free and reduced lunches and the prevalence of children being overweight or obese. When we take a look at table and figure 1; we see there is a direct relationship between these two variables. When the percentage of children on free or reduced lunches is higher; there seems to be a higher risk for these children to be obese. This is supported for six of the eight schools that were included in this study. Clinton and Hartley, which have a 94% and 84% rate of free or reduced lunch, show the highest rates of obesity, 25% and 23%. On the other side of that is Cavett and Maxey, 7% and 5% rate of free or reduced lunches; the obesity rates of these two schools is only 15% and 16%. The table and figure for children who are overweight also supports this work. The second graph shows an almost identical curve as does the graph for obesity. Percentages of children who are overweight is only slightly less than the percentages of children who are obese. The graph for

children who are overweight also shows a direct relationship with the percentages of children on free or reduced lunch. For the third variable, children passing the physical fitness test, it should have shown an inverse relationship. This graph shows that the percentages of children on free or reduced lunches are inversely related to the percentages of children passing this fitness test. This makes sense for this study because this relationship also supports the original hypothesis. When percentages of children on free or reduced lunches are higher, obesity and overweight percentages are also high. This ultimately means that these children are less than their peers and this shows in the third when the percentages of children passing the fitness test decreases when the percentage of free or reduced lunches increases.

**Discussion**

For the first part of this discussion I wanted to clarify a few things. I did not complete a study of distances to green space because in Lincoln this is not specific any one area. It does not matter what part of the city you find yourself in, there will always be a park or recreation area within walking distance. According to the Lincoln parks and recreation center, there is a park, trail, or recreation area within approximate one-half mile of any residence or community in Lincoln. There are 125 parks in Lincoln and over half are considered to be either neighborhood or mini-parks (Lincoln Parks and Recreation webpage). According to Lincoln parks and recreation there is over 4,000 acres of green space for community members to enjoy. Due to this information, it would have been useless to try to show a correlation between obese or overweight children and distance to parks or green space because they are the same distance from these areas as children with health weight ranges. The Lincoln parks and recreation website also provides information on the trail system within the Lincoln community. According to their website, there is approximately 128 miles of trails consisting of either crushed rock or paved surface. This gives

virtually anyone in Lincoln the ability to take trails or go to parks, making it difficult to show a correlation to obesity and distance to these objects. The only way to show a connection between these would be to collect data on park and trail usage by individuals who are considered to be overweight or obese and this was not the purpose of this project.

## Appendix: A

| School # | School Nan | %Overweig | Overweigh | %Obese | Obese | %Fit | Fit | %Free/Red | FreeReduc | %Minority | Minority |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 120 | Arnold | 20.2% | 20.20 | 20.4% | 20.35 | 60.0% | 60.00 | 64.4% | 64.40 | 34.7% | 34.7 |
| 121 | Adams | 14.8% | 14.84 | 9.1% | 9.11 | 78.1% | 78.13 | 11.7% | 11.70 | 16.5% | 16.5 |
| 123 | Beattie | 13.0% | 13.00 | 13.5% | 13.53 | 75.0% | 75.00 | 29.1% | 29.10 | 18.6% | 18.6 |
| 124 | Belmont | 15.5% | 15.50 | 18.8% | 18.83 | 73.8% | 73.76 | 73.5% | 73.50 | 41.3% | 41.3 |
| 127 | Brownell | 13.5% | 13.51 | 15.9% | 15.88 | 80.0% | 80.00 | 54.9% | 54.90 | 21.2% | 21.2 |
| 129 | Campbell | 16.1% | 16.14 | 13.5% | 13.45 | 74.6% | 74.62 | 52.7% | 52.70 | 37.2% | 37.2 |
| 130 | Calvert | 19.8% | 19.78 | 17.6% | 17.58 | 65.4% | 65.35 | 54.9% | 54.90 | 32.0% | 32 |
| 131 | Cavett | 15.6% | 15.61 | 11.4% | 11.42 | 75.9% | 75.89 | 7.4% | 7.40 | 11.6% | 11.6 |
| 132 | Clinton | 22.3% | 22.27 | 25.6% | 25.57 | 48.0% | 48.00 | 94.4% | 94.40 | 70.3% | 70.3 |
| 135 | Eastridge | 17.3% | 17.31 | 13.9% | 13.85 | 69.3% | 69.32 | 29.4% | 29.40 | 20.0% | 20 |
| 136 | Elliot | 17.3% | 17.28 | 24.6% | 24.61 | 82.7% | 82.71 | 93.0% | 93.00 | 71.6% | 71.6 |
| 139 | Hartley | 20.1% | 20.06 | 23.1% | 23.10 | 25.2% | 25.23 | 84.2% | 84.20 | 67.2% | 67.2 |
| 140 | Fredstrom | 15.3% | 15.27 | 14.6% | 14.64 | 70.9% | 70.89 | 22.4% | 22.40 | 14.7% | 14.7 |
| 142 | Hill | 14.2% | 14.23 | 13.2% | 13.16 | 71.4% | 71.43 | 23.2% | 23.20 | 13.3% | 13.3 |
| 143 | Holmes | 14.6% | 14.55 | 19.5% | 19.48 | 51.2% | 51.20 | 59.4% | 59.40 | 38.5% | 38.5 |
| 144 | Huntingtor | 18.1% | 18.08 | 21.4% | 21.43 | 34.3% | 34.33 | 82.1% | 82.10 | 39.4% | 39.4 |
| 145 | Humann | 13.8% | 13.82 | 10.2% | 10.24 | 82.7% | 82.68 | 16.1% | 16.10 | 11.5% | 11.5 |
| 146 | Kooser | 14.8% | 14.76 | 14.1% | 14.05 | 69.9% | 69.88 | 29.9% | 29.90 | 21.0% | 21 |
| 147 | Kahoa | 13.8% | 13.77 | 10.5% | 10.53 | 76.8% | 76.77 | 15.9% | 15.90 | 7.7% | 7.7 |
| 149 | Lakeview | 19.8% | 19.80 | 18.8% | 18.77 | 47.4% | 47.44 | 66.6% | 66.60 | 41.5% | 41.5 |
| 150 | McPhee | 19.2% | 19.23 | 25.8% | 25.77 | 39.5% | 39.47 | 93.1% | 93.10 | 71.3% | 71.3 |
| 151 | Meadow La | 19.0% | 18.99 | 15.9% | 15.89 | 53.6% | 53.57 | 51.3% | 51.30 | 28.9% | 28.9 |
| 153 | Maxey | 16.1% | 16.07 | 8.5% | 8.45 | 91.4% | 91.40 | 4.8% | 4.80 | 13.0% | 13 |
| 154 | Morley | 15.4% | 15.42 | 10.1% | 10.08 | 82.5% | 82.53 | 17.7% | 17.70 | 14.0% | 14 |
| 155 | Norwood | 13.4% | 13.43 | 21.6% | 21.64 | 66.7% | 66.67 | 70.0% | 70.00 | 30.0% | 30 |
| 159 | Everett | 18.4% | 18.38 | 26.3% | 26.26 | 46.6% | 46.58 | 94.2% | 94.20 | 75.6% | 75.6 |
| 160 | Pershing | 16.8% | 16.81 | 18.0% | 17.97 | 71.6% | 71.55 | 56.9% | 56.90 | 25.2% | 25.2 |
| 161 | Prescott | 11.4% | 11.42 | 15.2% | 15.23 | 54.7% | 54.72 | 69.8% | 69.80 | 37.1% | 37.1 |
| 162 | Pyrtle | 15.6% | 15.60 | 14.4% | 14.42 | 75.2% | 75.17 | 17.8% | 17.80 | 15.4% | 15.4 |
| 163 | Randolph | 18.3% | 18.34 | 17.1% | 17.06 | 43.6% | 43.56 | 49.8% | 49.80 | 27.2% | 27.2 |
| 164 | Riley | 19.7% | 19.65 | 19.1% | 19.08 | 72.5% | 72.48 | 61.3% | 61.30 | 29.4% | 29.4 |
| 165 | Rousseau | 15.3% | 15.34 | 13.4% | 13.35 | 77.5% | 77.53 | 27.5% | 27.50 | 17.9% | 17.9 |
| 166 | Saratoga | 11.5% | 11.52 | 18.4% | 18.43 | 79.7% | 79.71 | 82.7% | 82.70 | 49.5% | 49.5 |
| 167 | Sheridan | 11.8% | 11.79 | 9.8% | 9.83 | 87.7% | 87.68 | 19.2% | 19.20 | 10.5% | 10.5 |
| 168 | West Linco | 17.2% | 17.16 | 26.9% | 26.86 | 65.2% | 65.19 | 85.8% | 85.80 | 67.7% | 67.7 |
| 169 | Zeman | 16.5% | 16.51 | 15.3% | 15.31 | 80.4% | 80.43 | 34.5% | 34.50 | 26.0% | 26 |
| 170 | Roper | 17.5% | 17.49 | 14.8% | 14.79 | 55.7% | 55.65 | 42.7% | 42.70 | 28.9% | 28.9 |
| 210 | Culler | 23.2% | 23.20 | 34.3% | 34.34 | 70.6% | 70.62 | 82.6% | 82.60 | 60.6% | 60.6 |
| 212 | Park | 18.5% | 18.48 | 25.5% | 25.48 | 56.8% | 56.76 | 73.0% | 73.00 | 58.7% | 58.7 |
| 213 | Goodrich @ | 18.6% | 18.60 | 25.9% | 25.89 | 47.0% | 47.02 | 79.8% | 79.80 | 46.7% | 46.7 |
| 214 | Irving | 15.0% | 15.04 | 21.6% | 21.58 | 73.0% | 72.99 | 43.8% | 43.80 | 24.4% | 24.4 |
| 215 | Lelfler | 18.8% | 18.75 | 22.1% | 22.14 | 76.0% | 75.97 | 56.6% | 56.60 | 35.5% | 35.5 |
| 216 | Mickle | 20.7% | 20.67 | 20.9% | 20.94 | 61.5% | 61.53 | 42.0% | 42.00 | 17.4% | 17.4 |
| 217 | Pound | 16.7% | 16.67 | 17.8% | 17.79 | 60.4% | 60.44 | 24.9% | 24.90 | 16.6% | 16.6 |
| 218 | Scott | 15.6% | 15.58 | 12.4% | 12.44 | 84.1% | 84.07 | 15.0% | 15.00 | 17.1% | 17.1 |
| 220 | Lux | 15.2% | 15.17 | 10.3% | 10.34 | 75.8% | 75.82 | 10.5% | 10.50 | 12.4% | 12.4 |
| 222 | Schoo | 14.4% | 14.36 | 19.8% | 19.76 | 77.4% | 77.36 | 42.4% | 42.40 | 24.5% | 24.5 |

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